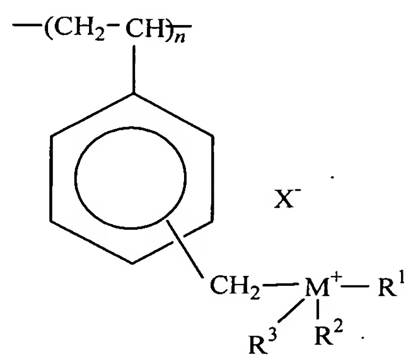
WHAT IS CLAIMED IS:

1. A solid support for chemiluminescent assays comprising a chemiluminescent quantum yield enhancing material and a plurality of probes for a biopolymer target, wherein the probes are covalently, ionically or physically attached to a surface of the solid support.

2. The solid support of Claim 1, wherein the chemiluminescent quantum yield enhancing material comprises a quaternary onium polymer having the general formula:



wherein n is a positive integer;

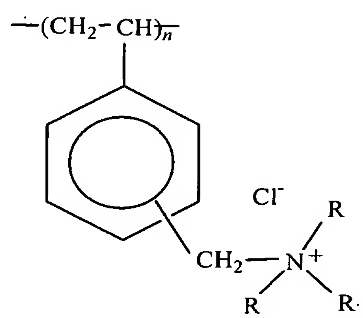
wherein R_1, R_2 and R_3 are independently: a straight or branched chain alkyl group having from 1 to 20 carbon atoms optionally substituted with one or more hydroxy, alkoxy, aryloxy, amino or substituted amino, amido, ureido, fluoroalkane or fluoroaryl groups; a monocycloalkyl group having from 3 to 12 carbon ring carbon atoms optionally substituted with one or more alkyl, alkoxy or fused benzo groups; a polycycloalkyl group having 2 or more fused rings, each ring having from 5 to 12 carbon atoms optionally substituted with one or more alkyl, alkoxy or aryl groups; an aryl, alkaryl or aralkyl group having at least one ring and from 6 to 20 carbon atoms optionally substituted with one or more alkyl, aryl, fluorine or hydroxy groups; wherein at least two of R_1, R_2 and R_3, together with the quaternary

nitrogen atom to which they are bonded, can form a saturated or unsaturated, unsubstituted or substituted nitrogen-containing, nitrogen and oxygen-containing or nitrogen and sulfur-containing ring having from 3 to 5 carbon atoms and 1 to 3 heteroatoms and which may be benzoannulated;

wherein M is a nitrogen or a phosphorous atom; and

wherein X^- represents a counter ion.

3. The solid support of Claim 1, wherein the chemiluminescent quantum yield enhancing material comprises a quaternary onium polymer having the general formula:



wherein n is a positive integer and each R is an n-pentyl group.

4. The solid support of Claim 1, wherein the quantum yield enhancing material is coated onto the surface of the solid support.

5. The solid support of Claim 1, wherein the quantum yield enhancing material is covalently attached to a surface of the solid support.

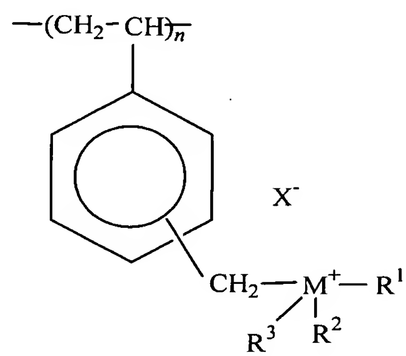
6. The solid support of Claim 5, wherein the probes are covalently attached to the quantum yield enhancing material.

7. The solid support of Claim 1, wherein the probes are probes for a nucleic acid target.

8. The solid support of Claim 1, wherein the probes are probes for a protein target.

9. The solid support of Claim 1, wherein the support comprises a polyamide layer and the probes are covalently attached to a surface of the polyamide layer.

10. The solid support of Claim 9, wherein the chemiluminescent quantum yield enhancing material comprises a quaternary onium polymer having the general formula:



wherein n is a positive integer;

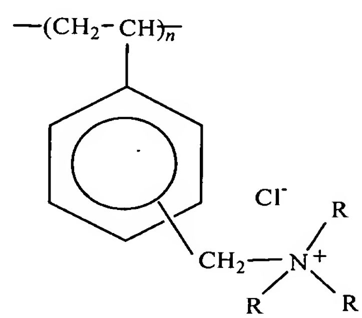
wherein R_1, R_2 and R_3 are independently: a straight or branched chain alkyl group having from 1 to 20 carbon atoms optionally substituted with one or more hydroxy, alkoxy, aryloxy, amino or substituted amino, amido, ureido, fluoroalkane or fluoroaryl groups; a monocycloalkyl group having from 3 to 12 carbon ring carbon atoms optionally substituted with one or more alkyl, alkoxy or fused benzo groups; a polycycloalkyl group having 2 or more fused rings, each ring having from 5 to 12 carbon atoms optionally substituted with one or more alkyl; alkoxy or aryl groups; an aryl, alkaryl or aralkyl group having at least one ring and from 6 to 20 carbon atoms optionally substituted with one or more alkyl, aryl, fluorine or hydroxy groups; wherein at least two of R_1, R_2 and R_3, together with the quaternary

nitrogen atom to which they are bonded, can form a saturated or unsaturated, unsubstituted or substituted nitrogen-containing, nitrogen and oxygen-containing or nitrogen and sulfur-containing ring having from 3 to 5 carbon atoms and 1 to 3 heteroatoms and which may be benzoannulated;

wherein M is a nitrogen or a phosphorous atom; and

wherein X^- represents a counter ion.

11. The solid support of Claim 9, wherein the chemiluminescent quantum yield enhancing material comprises a quaternary onium polymer having the general formula:



wherein n is a positive integer and each R is an n-pentyl group.

12. The solid support of Claim 9, wherein the surface of the polyamide layer comprises electrophilic groups formed by reacting carboxylate groups on the polyamide surface with an activating agent.

13. The solid support of Claim 9, wherein the surface of the polyamide layer comprises electrophilic groups formed by reacting amine groups on the polyamide surface with an activating agent.

14. The solid support of Claim 1, wherein the probes are covalently attached by reacting amine groups on the surface with an electrophilic functional group on the probe.

15. The solid support of Claim 12, wherein the electrophilic groups are selected from the group consisting of ester, acid halide, imidazolide, and anhydride groups.

16. The solid support of Claim 13, wherein the electrophilic groups are selected from the group consisting of urea, carbamate, dihalocyanurate, isothiocyanate, and isocyanate groups.

17. The solid support of Claim 9, wherein the probes are covalently attached by reacting electrophilic functional groups on the polyamide surface with nucleophilic functional groups on the probes.

18. The solid support of Claim 9, wherein the probes are covalently attached by reacting electrophilic groups on the surface of the functionalized polyamide layer with nucleophilic groups on the probes.

19. The solid support of Claim 18, wherein the nucleophilic groups on the probes are amine groups.

20. The solid support of Claim 1, wherein the probes are covalently attached to the surface of the solid support in a plurality of discrete regions.

21. The solid support of Claim 20, wherein the quantum yield enhancing material is only present in the plurality of discrete regions where the probes are attached to the surface of the solid support.

22. A kit for conducting chemiluminescent assays to determine the presence or absence of a component of an analyte, comprising:

a) a dioxetane substrate bearing an enzyme-labile protecting group which, when cleaved, yields a chemiluminescent reporter molecule; and

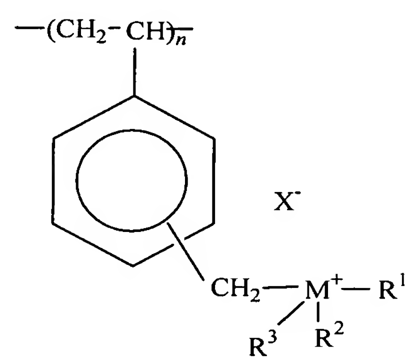
b) an antibody-enzyme complex and/or a nucleic acid probe-enzyme complex, wherein the antibody or nucleic acid probe is specific for said component,

and wherein the enzyme is capable of cleaving the enzyme-labile protecting group; and

c) a solid support;

wherein the solid support comprises a chemiluminescent quantum yield enhancing material and a plurality of probes for a biopolymer target and wherein the probes are covalently or physically attached to a surface of the solid support.

23. The kit of Claim 22, wherein the chemiluminescent quantum yield enhancing material comprises a quaternary onium polymer having the general formula:



wherein n is a positive integer;

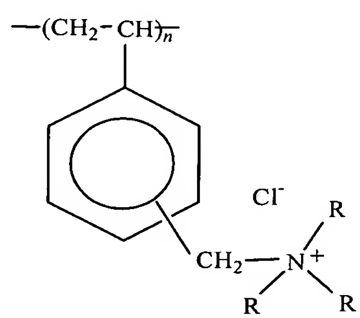
wherein R_1, R_2 and R_3 are independently: a straight or branched chain alkyl group having from 1 to 20 carbon atoms optionally substituted with one or more hydroxy, alkoxy, aryloxy, amino or substituted amino, amido, ureido, fluoroalkane or fluoroaryl groups; a monocycloalkyl group having from 3 to 12 carbon ring carbon atoms optionally substituted with one or more alkyl, alkoxy or fused benzo groups; a polycycloalkyl group having 2 or more fused rings, each ring having from 5 to 12 carbon atoms optionally substituted with one or more alkyl, alkoxy or aryl groups; an aryl, alkaryl or aralkyl group having at least one ring and from 6 to 20 carbon atoms optionally substituted with one or more alkyl, aryl, fluorine or

hydroxy groups; wherein at least two of R_1, R_2 and R_3, together with the quaternary nitrogen atom to which they are bonded, can form a saturated or unsaturated, unsubstituted or substituted nitrogen-containing, nitrogen and oxygen-containing or nitrogen and sulfur-containing ring having from 3 to 5 carbon atoms and 1 to 3 heteroatoms and which may be benzoannulated;

wherein M is a nitrogen or a phosphorous atom; and

wherein X^- represents a counter ion.

24. The kit of Claim 22, wherein the chemiluminescent quantum yield enhancing material comprises a quaternary onium polymer having the general formula:

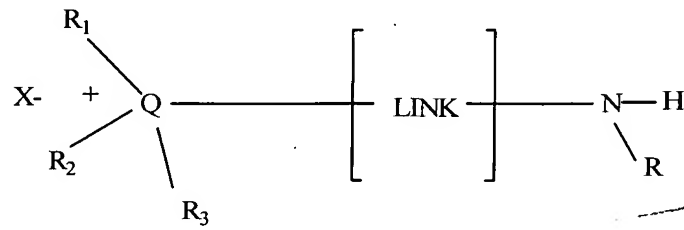


wherein n is a positive integer and each R is an n-pentyl group.

25. A method of modifying the surface of a solid support to enhance the quantum yield of chemiluminescent emissions, the method comprising reacting a functional group on a quantum yield enhancing compound with functional groups on the solid support surface to covalently attach chemiluminescent enhancing moieties to the solid support surface.

26. The method of Claim 25, wherein the functional groups on the solid support surface comprise azlactone groups.

27. The method of Claim 25, wherein the quantum yield enhancing compound comprises a quaternary onium polymer or a quaternary onium compound having the general formula:



wherein Q is N or P ; [LINK] is a divalent linker moiety; R_1, R_2 and R_3 are, independently, an alkyl group, an aryl group or a nitrogen heterocycle; R is hydrogen, an alkyl group, or an aryl group; and X^- is a counterion; and wherein the step of covalently bonding the enhancing moiety to the support surface comprises reacting an amino group on the quaternary onium polymer or the amino group on the quaternary onium compound with functional groups on the support surface.

28. The method of Claim 25, wherein the solid support comprises a polyamide, the method further comprising:

forming the functional groups on the polyamide surface by reacting amine or carboxylate groups on the polyamide surface with an activating agent.

29. The method of Claim 28, wherein the activating agent is reacted with amine groups and the activating agent is selected from the group consisting of: carbonyl diimidazole; dihydroxysuccinimidyl carbonate; phosgene; and phenylchloroformate.

30. The method of Claim 28, wherein the activating agent is reacted with carboxylate groups and the activating agent is selected from the group consisting of: dihydroxysuccinimidyl carbonate; carbodiimides; oxalyl chloride; and carbonyl diimidazole.

31. The method of Claim 25, wherein the quantum yield enhancing compound comprises a latent functionality, the method further comprising reacting a functional group on a probe for a biopolymer target with the latent functionality on the quantum yield enhancing compound to covalently attach the probe to the quantum yield enhancing compound.

32. A solid support for chemiluminescent assays comprising a functional polymer layer adjacent to a layer comprising a cationic microgel, wherein the functional polymer layer comprises an azlactone polymer layer or a porous polyamide layer.

33. The solid support of Claim 32, wherein the functional polymer layer comprises a copolymer of dimethylacrylamide and vinylazlactone crosslinked with ethylenediamine.

34. The solid support of Claim 33, wherein the layer comprising a cationic microgel comprises a cross-linked quaternary onium salt containing polymer.

35. The solid support of Claim 32, further comprising a backing material in contact with the layer comprising a cationic microgel.

36. The solid support of Claim 35, wherein the backing material comprises an oriented polymeric layer.

37. The solid support of Claim 34, wherein the cross-linked quaternary onium salt containing polymer comprises a quaternized azlactone functional polymer comprising azlactone functionalities quaternized with an amino functional quaternary onium salt or quaternized benzyl halide repeating units.

38. The solid support of Claim 32, further comprising a probe for a biopolymer target and/or a fluorescent moiety bonded to an exposed surface of the functional polymer layer.

39. A method of conducting a chemiluminescent assay wherein the presence or amount of one or more components of an analyte is determined, the method comprising steps of:

contacting the analyte with a solid support;

treating the analyte on the solid support with a biopolymer probe-enzyme complex;

incubating the enzyme complex treated analyte with an enzyme-cleavable 1,2-dioxetane, wherein the enzyme-cleavable 1,2-dioxetane can be cleaved by an enzyme to yield a chemiluminescent dioxetane reporter molecule; and

measuring the degree of chemiluminescence obtained;

wherein the solid support comprises an azlactone polymer layer adjacent to a layer comprising a cationic microgel or a porous polyamide layer adjacent to a layer comprising a cationic microgel; and

wherein the analyte is contacted with an exposed surface of the azlactone polymer layer or the porous polyamide layer opposite the cationic microgel layer.

40. The method of Claim 39, further comprising a step of washing the solid support surface after the treating step.

41. The method of Claim 39, wherein the functional polymer layer comprises an azlactone polymer layer and wherein the dioxetane reporter molecule has a half-life that is sufficiently long to allow the reporter molecule to diffuse through the functional polymer layer and become sequestered in the layer comprising a cationic microgel.

42. The method of Claim 41, wherein the dioxetane reporter molecule has a half-life of from about 2 seconds to about 60 minutes.

43. The method of Claim 39, further comprising a step of covalently bonding the probe to a surface of the functional polymer layer.

44. The method of Claim 39, wherein the biopolymer probe is an antibody, the method further comprising a step of binding an antigen target to the antibody.

45. The method of Claim 39, wherein the contacting step further comprises fixing the analyte on the exposed surface.

46. The method of Claim 39, wherein the reporter molecule is a dioxetane phenolate anion.

47. A method of conducting a chemiluminescent assay wherein the presence or amount of one or more components of an analyte is determined, comprising steps of:

contacting the analyte with an exposed surface of a solid support;

treating the analyte on the solid support with a biopolymer probe-enzyme complex;

incubating the enzyme complex treated analyte with an enzyme-cleavable 1,2-dioxetane, wherein the enzyme-cleavable 1,2-dioxetane can be cleaved by the enzyme to yield a chemiluminescent reporter molecule; and

measuring the degree of chemiluminescence obtained;

wherein the solid support comprises a quaternized azlactone functional polymer.

48. The method of Claim 47, wherein the quaternized azlactone functional polymer comprises azlactone repeating units quaternized with amino-functional quaternary onium compounds.

49. The method of Claim 47, wherein the azlactone functional polymer comprises quaternized benzyl halide repeating units.

50. The method of Claim 47, further comprising a step of covalently bonding the biopolymer probe to the solid support surface.

51. The method of Claim 47, wherein the contacting step further comprises fixing the analyte on the exposed surface.

52. A kit for conducting chemiluminescent assays to determine the presence or absence of a component of an analyte, comprising:

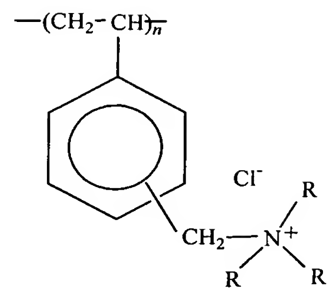
a) a dioxetane substrate bearing an enzyme-labile protecting group which, when cleaved, yields a chemiluminescent reporter molecule;

b) a biopolymer probe-enzyme complex, wherein the biopolymer probe is specific for the component being assayed, and wherein the enzyme is capable of cleaving the enzyme-labile protecting group; and

c) a solid support;

wherein the solid support comprises: an azlactone functional polymer layer adjacent to a cationic microgel layer; a porous polyamide layer adjacent to a cationic microgel layer; or a quaternized azlactone functional polymer layer.

53. A solid support for chemiluminescent assays comprising a polymer having a repeating unit defined by the formula:



wherein n is a positive integer and each R is an n-pentyl group.

54. The solid support of Claim 53, wherein the polymer is coated onto a support layer.

55. The solid support of Claim 54, wherein the support layer is a nitrocellulose, polyvinylidene fluoride or polyamide membrane.

56. The solid support of Claim 53, wherein the polymer is cross-linked.

57. A kit for conducting chemiluminescent assays to determine the presence or amount of a component of an analyte, comprising:

a) a dioxetane substrate bearing an enzyme-labile protecting group which, when cleaved, yields a chemiluminescent reporter molecule;

b) a biopolymer probe-enzyme complex, wherein the bipolymer probe is specific for the component being assayed, and wherein the enzyme is capable of cleaving the enzyme-labile protecting group; and

c) the solid support of Claim 53.

58. The kit of claim 57, wherein the biopolymer probe is selected from the group consisting of an antibody, a nucleic acid or an avidin probe.

59. A method of making a solid support for chemiluminescent assays having high feature density, the method comprising:

providing a shrinkable backing material;

applying a solid support to the shrinkable backing material;

applying a chemiluminescent quantum yield enhancing material to an exposed surface of the solid support;

applying a plurality of probes for a biopolymer target to an exposed surface of the solid support; and

shrinking the backing material.

60. The method of Claim 59, wherein the quantum yield enhancing material and/or the probes are applied to the exposed surface of the solid support in a plurality of spaced, discrete regions.

61. The method of Claim 59, wherein the quantum yield enhancing material and/or the probes are covalently attached to the exposed surface of the solid support.

62. The method of Claim 60, wherein the quantum yield enhancing material and/or the probes are covalently attached to the exposed surface of the solid support.

63. The method of Claim 59, wherein the solid support comprises an azlactone functional layer or a polyamide functional layer.

64. The method of Claim 59, wherein the solid support comprises an azlactone functional layer or a porous polyamide functional layer adjacent to a layer comprising a cationic microgel.

65. The method of Claim 59, wherein the shrinkable backing material comprises an oriented polymer layer.

66. A solid support made by the method of Claim 59.

67. A solid support made by the method of Claim 64.